beams, which are in quadrature and respectively equal to (i) the difference of the respective optical phases of the scattered first beam and the delayed second beam and (ii) the difference of the scattered delayed second beam and the first beam, with one of the emitted beams possessing an optical wavefront equivalent to the first scattered beam and with the other of the emitted beams possessing an optical wavefront equivalent to the second delayed beam; and,

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(f) directing the beams emitted by the adaptive beam combiner onto respective photodetectors and associated circuitry to result in an electrical output signal that is representative of the vibrating test surface.

REMARKS

In the official action, the Examiner objected to claims 16 and 20. The Examiner is thanked for the helpful comments and, as Examiner will note by reference to the amendments made above, claims 16 and 20 have been amended with an eye to addressing the Examiner's objections.

The Examiner also rejected claims 1-12 and 14-20 under 35 U.S.C. 103 as being unpatentable over US Patent No. 5,131,748 to Monchalin et al. in view of US Patent No. 5,894,531 to Alcoz. This grounds for rejection is respectfully traversed.

The Examiner asserts that Figure 3 of the '748 patent discloses an optical apparatus for coherent detection of an input optical beam. Assuming that characterization of the '748 patent is correct, then it is assumed that the Examiner is aware that laser 102 shown in Figure 3 of the '748 patent must have a coherence length which is longer than the path length difference between paths 100a and 100b. The insertion of a delay, particularly a considerable delay, could very well require a laser having an even longer coherence length which just increases the difficulty and cost of obtaining a suitable laser.

Laser make-up

Additionally, claim 1 recites "a beam splitter for splitting the input optical beam into a first component and a second component, the optical beam having information content with a minimum signal frequency component..." The Examiner asserts that beam

splitter 104 of the '748 patent meets this limitation. However, where is there any disclosure whatsoever in the '748 patent which indicates that laser 102 emits an optical beam "having information content with a minimum signal frequency component" as specifically required by claim 1? The Examiner is respectfully requested to reconsider Figure 3 of the '748 patent. Doesn't the information content in the '748 apparatus come from the ultra-sonic displacement or transient motion of surface 16? If the Examiner agrees with that proposition, then clearly the information content is not present in the beam when the beam transits splitter 104. Compare that with the drawings of Applicants' patent application where splitter 120 is disposed downstream of the workpiece. So, even if it makes sense to modify the '748 patent based upon the teachings of the '531 patent (which is denied), the resulting combination just cannot meet claim 1.

With respect to the suggestion of adding a delay means to the '748 patent, the Examiner is respectfully requested to read the first whole paragraph in column 3 and the paragraph bridging columns 3 and 4 of the '748 patent where it talks about the phase relationships of the beams meeting the photorefractive crystal. Note that according to the '748 patent that the optimum phase shift between the interfering beams is generally plus or minus $\pi/2 + 2\pi n$ where n is an integer for quadrature operation. Of course, as n gets bigger, that can cause problems with the coherence length as previously mentioned. Thus, it is believed that a person skilled in the art would try to seek quadrature for the interfering beams without having one path being particularly longer than the other path so that a less expensive short coherent length laser could be utilized.

The long and the short of it is that with respect to the '748 patent, the only possible motivation for inserting a delay line into Figure 3 would be to make the two path lengths the same or approximately the same with just enough phase-shift for quadrature detection to occur. But even with such a modification, Figure 3 still fails to read upon claim 1 since the beam splitter does not split an optical beam having information content with a minimum signal frequency component as specifically required by claim 1.

Turning to claim 6, claim 6 specifies that the second beam is delayed "by a period of time which is greater than an inverse of the minimum signal frequency component..." That cannot be met by the '748 patent since, if any delay is to be inserted, it would be to try to "almost" equalize the path lengths and not for delaying one of the beams by "a period of time which is greater than an inverse of the minimum signal frequency component" as specifically required by claim 6.

With respect to claim 11, claim 11 includes similar language, namely, that the apparatus includes an optical delay device "for delaying at least one of said first and second beams with a delay which is greater than an inverse of the minimum signal frequency component..." It is submitted that the combination suggested by the Examiner does not meet that limitation.

As the Examiner will note by reference to Applicants' application, there is a discussion in the first whole paragraph on page 5 of the application regarding the fact that the fiber imposing the delay should have a length which is greater than the inverse of the lowest frequency component. The length of the fiber could be in the range of 2km to 20cm depending upon the frequency of the ultrasonic transmitter. It is submitted that that is not the sort of delay that a person of ordinary skill in the art would insert in the '748 patent, if it could be avoided. As such, it is submitted that a person of ordinary skill in the art would not be motivated to modify the teachings of the '748 patent to include a delay device for imposing a delay which is "greater than an inverse of the minimum signal frequency component..." as specifically required by claim 11.

Reconsideration of this application as amended is respectfully submitted.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, then the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136 (a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

I hereby certify that this correspondence is being deposited with the United States Post Office with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C., 20231 on

March 20, 2003

(Date of Deposit)

Corinda Humphrey

(Name of Person Signing)

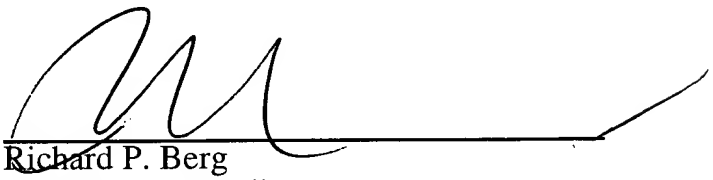
Corinda Humphrey

(Signature)

March 20, 2003

(Date)

Respectfully submitted,



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16. (Amended) The optical apparatus of claim 15 the [two exiting optical components] two exiting optical components have the same wavefronts and propagating directions as the first and second components and being in quadrature.

20. (Amended) A method for detecting sonic vibrations in a test material having a test surface comprising:

(a) generating a beam of light having a wavelength;

(b) splitting said beam into a first beam and a second beam;

(c) directing said first beam onto said test surface to be scattered by said test surface with data having a minimum signal frequency component;

(d) delaying the second beam by a period of time which is greater than an inverse of the minimum signal frequency component;

(e) directing at least a portion of said scattered first beam and the delayed second beam on an adaptive beam combiner, the adaptive beam combiner emitting two beams, which are in quadrature and respectively equal to (i) the difference of the respective optical phases of the scattered first beam and the delayed second beam and (ii) the difference of the scattered delayed second beam and the first beam, with one of the emitted beams possessing an optical wavefront equivalent to the first scattered beam and with the other of the emitted beams possessing an optical wavefront equivalent to the second delayed beam; and,

(f) directing the beams emitted by the adaptive beam combiner onto respective photodetectors and associated circuitry to result in an electrical output signal that is representative of the vibrating test surface.